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Highway projects: Prices in public bids

Renata Schneiderova Heralova*

Czech Technical University in Prague, Faculty of Civil Engineering, Thakurova 7. 166 29 Prague 6, Czech Republic

Abstract

Highways and roads are an important part of public assets in all countries, allowing movement between communities. As well as other types of infrastructure, the roads infrastructure requires a proper procurement process. The research shows that prices presented in public bids are lower than those expected by contracting authorities. Public owners are restricted to the public bidding procedures, especially the provision to use low bid price in the Public Procurement Act. Often a public owner has concerns about the contractor bidding with the lowest sum. Contractors are repeatedly requested to explain the reasons for their low price. This leads to time extension of the bid process. The lack of contracts for construction work and an additional competitive concern to win out in the bid process may be the reason for low prices. An incorrect calculation of the estimated contract price by the contracting authority itself could be another reason.

The cost analysis of two sections of highway clearly showed incorrect cost estimates by the relevant contracting authority. The difference was primarily due to significantly lower rates of indirect costs and profit, rebates granted when buying building materials, and lower cost of plant. The author summarizes the possible causes of the incorrect estimates of expected value and at the same time proposes methods to achieve better estimates for the contract price. The public sector may use the results of this study to identify the ineffectiveness of procurement in the area of infrastructure projects in the Czech Republic. The proposed procedures should improve the efficiency of procurement and provide better cost estimates by the public agencies.

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Keywords: Bid; highway estimates; proposed cost; unit price.

* Corresponding author. Tel.: +420-22435-4522; fax: +420-22435-5439.
E-mail address: heralova@fsv.cvut.cz

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1. Introduction and literature review

Highway constructions in the Czech Republic are procured using public contracts financed by the state budget [1]. The number and financial volume of these public contracts in 2013 and 2014 is presented in Table. 1.

Table 1. Public contracts in the area of highway construction in the Czech Republic

Year	Number	Volume (*EUR*)
2013	1676	1 682 000 000
2014	1607	1 946 000 000

Public owners, such as government agencies, have to use specific procurement methods. The contracting authority must proceed according to the Public Procurement Act. The contracting authority defines the scope of the project, usually with a detailed set of plans, specifications and detailed quantity take-ups. The contracting authority requires detailed cost estimates as part of all proposals.

Contractors submit a unit price; the contractor with the lowest sum should be selected for award. Bid contracts generally are awarded solely on price. The contracting authority may require prospective contractors to submit documentation of their qualifications for review; this is known as prequalification of contractors. The contracting authority selects the contractor submitting the proposal that is ranked highest based on the owner´s evaluation criteria (typical criteria include price, project duration, expertise of project management team, contractor´s experience with similar projects), and negotiates a contract price [2,3,4].

Enhancement of the competitiveness of a construction company is one of the most important strategic objectives in the construction industry. The company's management system, work organization and employment of available assets are some of the most important factors through which overhead costs and the bidding price of a construction company depend directly [5].

The prices presented in public tenders are lower nowadays than those expected by contracting authorities. Bid prices reach only 60% - 70% of the anticipated price determined by the contracting authority. This situation seems to be a significant problem. The contracting authorities are inhibited in selecting the contractor with the lowest sum because of this difference. During the last few years, the Czech Republic became a place where this issue has been thoroughly tested in practice in many sectors. One of the main problems with an abnormally bid tender price is the proper identification of low tender price practices without affecting the competition itself. Contractors may offer advanced solutions allowing for significant reduction of prices.

The issue of abnormally low tender prices has become a problem for many public procurement markets in Europe. In autumn 2013, the European Bank for Reconstruction and Development (EBRD) organized a special conference dedicated to this problem.

The issue of cost of highway projects has received much study, especially at national level [6,7]. There are also several studies in the Czech Republic that relate specifically to the project efficiency of the construction and maintenance of highways within the life cycle [8].

Few highway agencies use performance measures for cost estimating. The study [9] synthesizes, categorizes, and validates existing performance measures for cost estimating of highway projects in order to assist with improving estimating accuracy.

The findings from the review [10] showed the importance of incorporating the effect of each determined estimating factor used by state planning organizations when preparing initial estimates to avoid cost under/over estimation and/or to reduce the errors associated with such estimates.

The result from the empirical study [11] is that most cost overruns occur in the initiation and planning stages up to the final design and are related to design changes and increases in the amount of inputs needed because of technical and administrative problems.

The study [12] shows that the major causes of inaccuracy in cost estimating continue to be the lack of practical knowledge of the construction process by those responsible for the estimating function, insufficient time to prepare cost estimates, poor tender documentation and the wide variability of subcontractors' prices.

The findings of an investigation into the current practices for estimating the indirect costs involved in tendering for construction work is presented in [13]. It shows the results of a survey of current practices and attitudes in firms towards the quantification and allocation of general overheads, risk contingencies and profit in a tender. The survey indicates that the methods used are highly subjective and are based on past experience.

2. Abnormally low tender price

An abnormally low tender (ALT) is not defined in Czech or EU legislation, nor specified by Czech case law. Czech legislation only sets forth procedural rules applicable when an abnormally low tender is identified. Although vague, the legal concept of an abnormally low tender was introduced by the legislator to protect contracting authorities against undesirable practical consequences, such as:

- The failure to complete the public tender.
- The use of cheap and poor quality material to reduce the price.
- An increase on the tender price due to required extra work.

The abnormally low tender concept also has significant procedural aspects related to various claims, objections and disputes. Application of the concept falls under the full discretion of the particular evaluation committee assessing the tenders. The following questions are relevant. How can it be ascertained that a tender contains an “abnormally” low tender price? How can contracting authorities avoid an abnormally low tender price?

2.1. Verification of an abnormally low tender

Whether a tender is abnormally low depends on a final decision of the evaluation committee, which may carry out market research or make use of authorized experts for the assessment.

To identify an abnormally low tender, it is necessary:

- To assess the tender price in relation to the subject matter of the given public contract.
- To account for the specifics of the given industry, with the circumstances and conditions under which the public contract would be fulfilled.
- To consider notice from other competing participants on abnormally low tenders.

The main reason for this approach is that the abnormally low tender concept is not subject to any numerical criteria or specific guidelines.

If an abnormally low tender is identified, the tenderer may not be automatically excluded. First, the contracting authority must request, in writing, details of the relevant elements of the tender and verify the collected data based

on the tenderer's explanations. The request for clarification must be sufficiently precise; otherwise, the Czech Office for the Protection of Competition (Office) may impose various sanctions within the framework of its administrative supervision.

If the tenderer does not provide an explanation, or it is considered as unfounded by the evaluation committee, the tenderer shall be in principle excluded.

As shown, the Czech contracting authorities have full discretion to decide what constitutes an abnormally low tender. Without objective numerical criteria, the discretion of the contracting authorities can result in unpredictable decision-making based on double or contradictory standards. Contracting authorities may have different interpretations of what constitutes an abnormally low tender in identical cases.

2.2. The impact of the Directive 2014/24/EU

Difficulties with the verification of abnormally low tenders were supposed to have been largely solved by the original draft of the Directive Nr. 2014/24/EU (Directive) [14]. This Directive must be transposed into national legal orders by 18 April 2016. The original draft Directive set forth the following three numerical indicators to calculate an abnormally low tender. The cumulative existence of these would require that the contracting authority ask the tenderer to explain the tender price if:

- It is more than 50% lower than the average of other bids.
- It is more than 20% lower than the second-lowest bid.
- At least five bids have been submitted.

After some modifications, these criteria were completely omitted from the final wording of the Directive and replaced with a general provision. This new Directive has failed to shed light on the verification of an abnormally low tender.

2.3. Avoiding abnormally low tender

To avoid abnormally low tenders, the contracting authority must properly determine the expected value of the public contract or set a threshold as to what constitutes an abnormally low tender in the given case.

The expected value of the public contract must be determined by means of:

- Information on public contracts of the same kind.
- Information gained via market research of the relevant market.
- Other such objective measures in some other suitable form (e.g. expert opinion).

Based on the expected value, the contracting authority will make an assessment of realistic expenditures for tenders and set an ultimate limit. An explanation of the tender is then mandatory. Some public owners decided to establish a threshold of 20% - 30% of the estimated contract value or the arithmetic average of the offers. The contracting authorities will then ask the bidder to provide an explanation of the proffered price because it is lower than the indicated threshold.

This does three things. First, it motivates tenderers to submit only tenders that reflect market prices in order to be discharged from the obligation to provide the contracting authority with explanations. Second, it eliminates the possibility of potential exclusion of the tenderers from the tender. And third, it protects the contracting authority against the potential procedural risks mentioned above.

3. Expected value of the public contract

As mentioned, the contracting authority must properly determine the expected value of the public contract. The author recommends providing a detailed cost estimate. The data on public contracts of the same kind, in-house databases, published estimating databases, along with current and accurate pricing data should be used.

Cost estimating is the process of analyzing a specific scope of work and predicting the cost of performing the work. The accuracy of the estimate is a function of how well the specific scope of work is defined. Cost estimating involves collecting, analyzing, and summarizing all available data pertaining to a project. The data may consist of a rough concept of the gross area or volume of a project, or it may be a set of detailed plans and specifications. Cost estimates are developed and updated throughout the design and construction phases of a project. The estimate may be based on an estimated gross cost per component or element of work, or it may be based on individual labor, material, equipment, or subcontractor estimated costs for each. The accuracy of the cost estimate will depend on the completeness of design documents. Conceptual cost estimates are developed using incomplete project documentation, for example, during programming and schematic design. Detailed cost estimates are prepared based on fully developed construction drawings and specifications [15,16].

4. The methodology of determining the essential costs

4.1. The principle of the proposed methodology: Unit rates

Unit rates are usually a combination of rates for labor, plant, materials and subcontractors. The direct costs and the minimum unit price are calculated based on the commonly used calculation format. Preliminaries (the site cost of administering project and providing general plant, site staff, facilities and site-based services and other items) are included in these rates. The absolutely necessary cost (minimum price) means the price, which usually reaches the level of direct cost per cost unit, while also covering indirect costs (overheads, preliminaries) in the necessary amount. Also profits are included in the unit rate. In-house databases, published estimating databases (for example URS Prague, RTS, Callida, ASPE in the Czech Republic), and current, accurate pricing data is to be used.

The model of minimum cost calculation is given in Fig.1

Minimum cost *(MinCost)*						
Direct cost *(DC)*				Indirect cost *(IC)*		Profit
Material	Labor	Plant	Sub	Overhead I	Overhead II	
(M)	*(L)*	*(P)*	*(S)*	*(O1)*	*(O2)*	*(Prof)*
DC=M+L+P+S				IC=O1+O2		Prof
MinCost = DC + IC + Prof						

Fig. 1. Model of minimum cost calculation.

The break down in the sheet figures was designed to determine the essential costs of the construction work. The break down contains a description of the item, a clear definition in terms of technology, design, materials, and scale. Also, a recap of the various cost elements is provided in the calculation breakdown- direct costs (materials, labor, plant and equipment, other direct costs) and indirect costs (overheads) and profit. The important part of the break down is a detailed calculation of direct costs in the breakdown of wages, materials and plant. Indirect costs are fixed by a costing of overhead rates.

The model of calculation for one of the items is given in Fig.2

4.2. The verification of the methodology

The methodology was tested in determining the essential costs of selected items for the highway bids. The contracting authority used expected value for public bids and ones that were significantly different from the bids of other tenders. The expected value was estimated using the in-house database of the contracting authority.

Expert opinion using the proposed methodology was requested from the author and her team. The cost analysis of two sections of highway clearly showed incorrect cost estimates of the contracting authority. The difference is primarily due to significantly lower rates of indirect costs and profit on the side of tenderers, lower cost when buying building materials, and lower cost of plant. Differences in direct costs of up to 30% can be explained by lower material costs (from tenders resourcing), using plant with high performance and using previously written-off plant/ equipment etc.

Table 2 shows the cost estimates of the contracting authority against minimum price estimates.

Table 2. An example of In-house vs. minimum price estimates.

Nr.	Item identification	Direct cost (*EUR*)	Minimum price (*EUR*)	In-house database *(EUR)*	Difference
11372.03	mill in road asphalt	14,55	15,85	36,79	232%
12110.03	topsoil removal	1,69	1,84	4,07	221%
12373.05	digging soil	1,67	1,82	7,07	388%
56313	roadway layer from mechanically solidified aggregates 150 mm	2,37	2,58	5,29	205%
21452.01	redevelopment layer from crushed aggregate	2,78	3,03	22,29	735%
56314.01	roadway layer from mechanically solidified aggregates 200 mm	2,65	2,89	6,82	236%
224324	pilots reinforced concrete C25 / 30	55,63	60,60	122,50	202%
224365	reinforcement steel pilot 10505	519,63	566,03	960,71	170%
264142	pilots drilling for 1200mm	41,17	44,85	82,14	183%

COST ITEM BREAK DOWN

Nr.:	18	Nr. (ASPE):	56313
Quantity:	1 970,200	Unit of measure:	M2
Item identification:	**Roadway layer from mechanically solidified aggregates 150mm**		
Full text:	0/32 150 mm - Supply of aggregates of required quality and granularity - Spreading and compacting layers of the required thickness - Routing layers in stages - Does not include sprays, paints		
Part of project:	SO 132		
Project:	Motorway Nr. D3 0308C Veseli nad Luznici - Bosilec		

Direct cost (EUR/m2)				Overhead I (EUR)	Overhead II (EUR)	Profit (EUR)	Minimum cost (EUR/m2)
Material	Labor	Plant	Sub				
2,15	0,05	0,14	0	0,08	0,11	0,02	2,58
2,37							

Direct cost calculation

564251111	**Item of direct cost**	**m2**	**quantity**	**unit price**	**price**	**EUR**
082113210	water	m3	0,030	1,19	0,04	2,15
583373680	gravel	T	0,304	6,96	2,11	
712000-S2-T2	worker	hour	0,010	3,04	0,03	0,05
833000-S3-T2	grader operator	hour	0,006	3,39	0,02	
022172230100	grader 193 kW working width 4,3 m	hour	0,003	23,21	0,07	0,14
043153610100	vibratory roller working width 2,30 m 18,5 t	hour	0,002	28,57	0,06	
101531019600	spraying truck volume 7 m3	hour	0,001	17,86	0,01	

Fig. 2. Example of calculation of item.

5. Conclusion

The contracting authority must provide a better estimate for the expected value of public contracts. The author recommends providing detailed cost estimates for each tender. Current and accurate pricing data should be used. Second, the data from in-house databases should be verified. In-house database prices of selected items were 40% - 635% higher than the minimum cost calculated using the proposed methodology. The difference is primarily due to significantly lower rates of indirect costs and profit, achieved rebates when buying building materials, and lower cost of the plant. The differences in direct costs of up to 30% can be explained by lower material costs (from tenders resourcing), using plant with high performance and using previously written-off plant/equipment etc.

The public sector should use the results of the study to identify ineffectiveness of procurement in the area of infrastructure projects in the Czech Republic. The proposed procedures should improve the efficiency of procurement.

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